IN THE CLAIMS:

1. A flexible microwave antenna assembly for a surgical ablation instrument adapted to ablate a surface of a biological tissue, said ablation instrument including a transmission line having a proximal portion suitable for connection to an electromagnetic energy source, said antenna assembly comprising:

a flexible antenna coupled to the transmission line for radially generating an electric field sufficiently strong to cause tissue ablation;

a flexible shield device coupled to said antenna to substantially shield a surrounding area of the antenna from the electric field radially generated therefrom while permitting a majority of the field to be directed generally in a predetermined direction; and

a flexible insulator disposed between the shield device and the antenna, and defining a window portion enabling the transmission of the directed electric field in the predetermined direction,

wherein said antenna, said shield device and said insulator are formed for selective manipulative bending thereof, as a unit, to one of a plurality of contact positions to generally conform said window portion to the biological tissue surface to be ablated.

2. The microwave antenna assembly according to claim 1 wherein,

a proximal end of said antenna is operably coupled to a distal end of an inner conductor of said transmission line, and

a proximal end of said shield device is operably coupled to a distal end of an outer conductor of said transmission line.

3. The microwave antenna assembly according to claim 1 wherein,

said insulator is generally elongated when oriented in a substantially linear normal position.

4. The microwave antenna assembly according to claim 3 wherein,

said antenna is disposed between the shield device and the window portion longitudinally along said insulator.

5. The microwave antenna assembly according to claim 4 wherein,

said window portion is substantially planar in the normal position.

6. The microwave antenna assembly according to claim 4 wherein,

a longitudinal axis of said antenna is off-set from a longitudinal axis of said insulator to position said antenna substantially proximate to and adjacent said window portion.

7. The microwave antenna assembly according to claim 4 wherein,

said shield device is in the shape of a semi-cylindrical or semi-ellipsoid shell having a longitudinal axis generally co-axial with a longitudinal axis of said insulator.

8. The microwave antenna assembly according to claim 7 wherein,

a longitudinal axis of said antenna is off-set from a longitudinal axis of said insulator to position said antenna substantially proximate to and adjacent said window portion.

9. The microwave antenna assembly according to claim 2 wherein,

said shield device includes a flexible braided metallic strip.

10. The microwave antenna assembly according to claim 9 wherein,

said shield device is in the shape of a semi-cylindrical shell having a longitudinal axis generally co-axial with a longitudinal axis of said insulator.

11. The microwave antenna assembly according to claim 1 wherein,

said insulator is composed of a dielectric material adapted to minimize the energy transfer between the electromagnetic wave and the material.

12. The microwave antenna assembly according to claim 11 wherein,

said material consists essentially of TEFLON®, silicone, polyethylene, and polyimide.

13. The microwave antenna assembly according to claim 1 wherein,

said insulator defines a receiving passage formed for sliding receipt of said antenna longitudinal therein during manipulative bending of the antenna assembly.

14. The microwave antenna assembly according to claim 13 further including:

a tube device positioned in said receiving passage proximate the distal end of said antenna, and having a bore formed and dimensioned sliding longitudinal reciprocation therein of at least the distal end of said antenna.

15. The microwave antenna assembly according to claim 14 wherein,

said tube device is composed of a material having a low loss dielectric material

16. The microwave antenna assembly according to claim 15 wherein,

said tube device is a polyimide tube.

17. The microwave ablation instrument according to claim 13 further including:

an elongated, bendable, retaining member coupled longitudinally therealong to said insulator in a manner enabling the insulator to retain the one

contact position after manipulative bending thereof for said conformance of the window portion to the biological tissue surface to be ablated.

18. The microwave antenna assembly according to claim 1 further including:

an elongated, bendable, retaining member coupled longitudinally therealong to said insulator in a manner enabling the insulator to retain the one contact position after manipulative bending thereof for said conformance of the window portion to the biological tissue surface to be ablated.

19. The microwave antenna assembly according to claim 18 wherein,

said retaining member is embedded in the flexible insulator.

20. The microwave antenna assembly according to claim 19 wherein,

said retaining member is composed of a metallic material having a transverse cross-sectional dimension sufficient to resist the resiliency of said insulator back to the normal position.

21. The microwave antenna assembly according to claim 17 wherein,

said retaining member is disposed longitudinally along said insulator, and on one said of said shield device, and

said antenna is disposed on an opposite side of said shield device, longitudinally along said insulator, and between the shield device and the window portion.

22. The microwave antenna assembly according to claim 21 wherein,

a longitudinal axis of said antenna is off-set from a longitudinal axis of said insulator to position said antenna substantially proximate to and adjacent said window portion.

23. The microwave antenna assembly according to claim 22 wherein,

said shield device is in the shape of a semi-cylindrical shell having a longitudinal axis generally co-axial with a longitudinal axis of said insulator.

24. A microwave ablation instrument adapted to ablate a surface of a biological tissue comprising:

a handle member formed for manual manipulation of said ablation instrument;

an elongated transmission line coupled to said handle member, and having a proximal portion suitable for connection to an electromagnetic energy source; and

a flexible antenna assembly coupled to said handle member and to the transmission line, and adapted to transmit an electric field out of a window portion thereof sufficiently strong to cause tissue ablation, said antenna assembly being formed for selective manipulative bending thereof to one of a plurality of contact positions to generally conform said window portion to the biological tissue surface to be ablated.

25. The microwave ablation instrument according to claim 24 wherein,

said antenna assembly includes:

a flexible antenna coupled to the transmission line for radially generating said electric field; and

a flexible shield device to substantially shield a surrounding radial area of the antenna from the electric field radially generated therefrom while permitting a majority of the field to be directed generally in a predetermined direction.

26. The microwave ablation instrument according to claim 24 wherein,

said antenna assembly further includes a flexible insulator disposed between the shield device and the antenna, and defining said window portion enabling the transmission of the directed electric field in the predetermined

direction, said antenna, said shield device and said insulator being formed for selective manipulative bending thereof, as a unit, to said one of a plurality of contact positions.

27. The microwave ablation instrument according to claim 26 further including:

a bendable, malleable shaft having a proximal portion coupled to said handle member, and an opposite a distal portion coupled to said antenna assembly.

28. The microwave ablation instrument according to claim 27 wherein,

a proximal end of said antenna is operably coupled to a distal end of an inner conductor of said transmission line, and

a proximal end of said shield device is operably coupled to a distal end of an outer conductor of said transmission line.

29. The microwave ablation instrument according to claim 28 wherein,

said shaft is tubular and conductive having a distal portion conductively coupled to the proximal end of said shield device, and another portion conductively coupled to said outer conductor of said transmission line in a manner causing said shaft to form part of said transmission line.

30. The microwave ablation instrument according to claim 28 wherein,

said shaft is provided by a semi-rigid coaxial cable including an outer conductor and an inner conductor, the coaxial cable outer conductor having a distal portion conductively coupled to the proximal end of said shield device, and another portion of the coaxial cable outer conductor conductively coupled to said outer conductor of said transmission line, and the coaxial cable inner conductor having a proximal portion conductively coupled to a distal end of said inner conductor of said transmission line.

31. The microwave ablation instrument according to claim 28 wherein,

said insulator is coupled to the distal portion of said shaft, and generally cylindrical-shaped when oriented in a substantially linear normal position.

32. The microwave ablation instrument according to claim 31 wherein,

said antenna is disposed between the shield device and the window portion longitudinally along said insulator.

33. The microwave ablation instrument according to claim 32 wherein,

said window portion is substantially planar in the normal position.

34. The microwave ablation instrument according to claim 33 wherein,

said shield device is in the shape of a semi-cylindrical shell having a longitudinal axis generally co-axial with a longitudinal axis of said insulator.

35. The microwave ablation instrument according to claim 34 wherein,

a longitudinal axis of said antenna is off-set from a longitudinal axis of said insulator to position said antenna substantially proximate to and adjacent said window portion.

36. The microwave ablation instrument according to claim 35 wherein,

said shield device includes a flexible braided metallic strip.

37. The microwave ablation instrument according to claim 34 further including:

an elongated, bendable, retaining member coupled longitudinally therealong to said insulator in a manner enabling the insulator to retain the one contact position after manipulative bending thereof for said conformance of the window portion to the biological tissue surface to be ablated.

38. The microwave ablation instrument according to claim 28 wherein,

said insulator is comprised of a hydro-phobic material molded to the distal portion of said shaft.

39. The microwave ablation instrument according to claim 26 wherein,

said insulator defines a receiving passage formed for sliding receipt of said antenna longitudinal therein during manipulative bending of the antenna assembly.

40. The microwave ablation instrument according to claim 26 further including:

a tube device positioned in said receiving passage proximate the distal end of said antenna, and having a bore formed and dimensioned for sliding longitudinal reciprocation therein of at least the distal end of said antenna.

41. The microwave ablation instrument according to claim 40 further including:

an elongated, bendable, retaining member coupled longitudinally therealong to said insulator in a manner enabling the insulator to retain the one contact position after manipulative bending thereof for said conformance of the window portion to the biological tissue surface to be ablated.

42. The microwave ablation instrument according to claim 26 further including:

an elongated, bendable, retaining member coupled longitudinally therealong to said insulator in a manner enabling the insulator to retain the one contact position after manipulative bending thereof for said conformance of the window portion to the biological tissue surface to be ablated.

43. The microwave ablation instrument according to claim 42 wherein,

said retaining member is embedded in the flexible insulator.

44. The microwave ablation instrument according to claim 42 wherein,

said retaining member is composed of a metallic material having a transverse cross-sectional dimension sufficient to resist the resiliency of said insulator back to the normal position .

45. The microwave ablation instrument according to claim 44 wherein,

said retaining member is disposed longitudinally along said insulator, and on one said of said shield device, and

said antenna is disposed on an opposite side of said shield device, longitudinally along said insulator, and between the shield device and the window portion.

46. The microwave ablation instrument according to claim 30 further including:

a restraining sleeve adapted to limit the bending movement of said bendable antenna assembly at the conductive coupling between the shield device and the shaft.

47. The microwave ablation instrument according to claim 46 wherein,

said restraining sleeve is formed and dimensioned to extend peripherally over the conductive coupling to limit said bending movement in a predetermined direction to maintain the integrity of conductive coupling.

48. The microwave ablation instrument according to claim 47 wherein,

said shield device is in the shape of a semi-cylindrical shell having a longitudinal axis generally co-axial with a longitudinal axis of said insulator, and

said restraining sleeve includes a curvilinear transverse cross-sectional dimension extending past said conductive coupling longitudinally therealong by an amount sufficient to maintain said integrity.

49. The microwave ablation instrument according to claim 29 wherein:

the transmission line is a coaxial transmission line suitable for transmission of microwave energy at frequencies in the range of approximately 800 to 6000 megahertz, the coaxial transmission line having a center conductor, a shield and a dielectric material disposed between the center conductor and shield.

50. The microwave ablation instrument according to claim 26 further including:

an elongated gripping member having a distal grip portion and an opposite proximal portion coupled to a distal portion of said antenna assembly, said grip member and said handle member cooperating to selectively bend said antenna assembly and selectively urge the window portion in abutting contact with the biological tissue surface to be ablated.

51. The microwave ablation instrument according to claim 50 wherein,

said insulator defines a receiving passage formed for sliding receipt of said antenna longitudinal therein during manipulative bending of the antenna assembly.

52. The microwave ablation instrument according to claim 50 wherein,

said gripping member is provided by an elongated flexible rod having a diameter smaller than a diameter of said insulator.

53. The microwave ablation instrument according to claim 52 wherein,

a longitudinal axis of said antenna is off-set from a longitudinal axis of said insulator to position said antenna substantially proximate to and adjacent said window portion, and

a longitudinal axis of said flexible rod is off-set from the longitudinal axis of said insulator to position said rod in general axial alignment with said antenna, and adjacent said window portion.

54. The microwave ablation instrument according to claim 50, wherein

said handle member is a flexible elongated member having a proximal portion coupled to said transmission line, and an opposite a distal portion coupled to said antenna assembly.

55. The microwave ablation instrument according to claim 54, wherein

said flexible elongated member is a coaxial cable including an outer conductor and an inner conductor, the coaxial cable outer conductor having a distal portion conductively coupled to the proximal end of said shield device, and another portion of the coaxial cable outer conductor conductively coupled to said outer conductor of said transmission line, and the coaxial cable inner conductor having a proximal portion conductively coupled to a distal end of said inner conductor of said transmission line.

56. A method for treatment of a heart comprising:

providing an ablation instrument having a flexible antenna assembly defining a window portion enabling the transmission of a directed electric field therethrough in a predetermined direction;

selectively bending the flexible antenna assembly to one of a plurality of contact positions to generally conform the shape of said window portion to the targeted biological tissue surface to be ablated;

manipulating the ablation instrument to strategically position the conformed window portion into contact with the targeted biological tissue surface; and

generating the electric field sufficiently strong to cause tissue ablation to the targeted biological tissue surface.

57. The method of claim 56, wherein

said flexible antenna assembly includes:

a flexible antenna for radially generating the electric field;

a flexible shield device coupled to said antenna to substantially shield a surrounding area of the antenna from the electric field radially generated therefrom while permitting a majority of the field to be directed generally in the predetermined direction; and

a flexible insulator disposed between the shield device and the antenna, and defining said window portion enabling the transmission of the directed electric field in the predetermined direction.

58. The method of claim 57, further including:

repeating the bending, manipulating and generating events to form a plurality of strategically positioned ablation lesions.

59. The method of claim 58, wherein

the lesions are formed to create a predetermined conduction pathway in the muscular tissue wall of the targeted biological tissue and/or to divide the left and/or right atria to substantially prevent reentry circuits.

60. The method of claim 57, further including:

an elongated, bendable, retaining member coupled longitudinally therealong to said insulator in a manner enabling the insulator to retain the one contact position after manipulative bending thereof for said conformance of the window portion to the biological tissue surface to be ablated.

61. The method of claim 60, wherein

said retaining member is embedded in the flexible insulator.

62. The method of claim 56, wherein

the heart remains beating throughout the bending, manipulating and generating events.

63. The method of claim 56, further including:

arresting the patient's heart.

64. The method of claim 56, further including:

temporarily arresting the patient's heart.

65. The method of claim 56, wherein

said ablation instrument is a microwave ablation instrument.

66. A method for ablating medically refractory atrial fibrillation of the heart comprising:

providing an ablation instrument having a flexible antenna assembly adapted to generate an electric field sufficiently strong to cause tissue ablation, said antenna assembly defining a window portion enabling the transmission of the electric field therethrough in a predetermined direction;

selectively bending and retaining the flexible antenna assembly in one of a plurality of contact positions to generally conform the shape of said window portion to the targeted biological tissue surface to be ablated;

manipulating the ablation instrument to strategically position the conformed window portion into contact with the targeted biological tissue surface; and

forming an elongated lesion in the targeted biological tissue surface through the generation of the electric field by the antenna assembly.

67. The method of claim 66, wherein

said flexible antenna assembly includes:

a flexible antenna for radially generating the electric field;

a flexible shield device coupled to said antenna to substantially shield a surrounding area of the antenna from the electric field radially generated therefrom while permitting a majority of the field to be directed generally in the predetermined direction; and

a flexible insulator disposed between the shield device and the antenna, and defining said window portion enabling the transmission of the directed electric field in the predetermined direction.

68. The method of claim 67, further including:

repeating the bending, manipulating and generating events to form a plurality of strategically positioned ablation lesions and/or to divide the left and/or right atria to substantially prevent reentry circuits.

69. The method of claim 68, wherein

the lesions are formed to create a predetermined conduction pathway between a sinoatrial node and an atrioventricular node of the heart.

70. The method of claim 68, wherein

said repeating the bending, manipulating and generating events are applied in a manner isolating the pulmonary veins from the epicardium of the heart.

71. The method of claim 67, further including:

an elongated, bendable, retaining member coupled longitudinally therealong to said insulator in a manner enabling the insulator to retain the one contact position after manipulative bending thereof for said conformance of the window portion to the biological tissue surface to be ablated.

72. The method of claim 71, wherein

said retaining member is embedded in the flexible insulator.

73. The method of claim 66, wherein

the heart remains beating throughout the bending, manipulating and generating events.

74. The method of claim 73, wherein

said biological tissue surface includes the epicardium of the heart during a minimally invasive heart procedure.

75. The method of claim 66, further including:

arresting the patient's heart.

76. The method of claim 66, further including:

temporarily arresting the patient's heart.

77. The method of claim 75, wherein

said biological tissue surface includes the endocardium of one of the left atrium and the right atrium during an open-heart procedure.

78. The method of claim 65, wherein

said ablation instrument is a microwave ablation instrument.

79. The method of claim 66, wherein

said ablation instrument includes an elongated flexible gripping member having a distal grip portion and an opposite proximal portion coupled to a distal portion of said antenna assembly, and a handle member coupled to a proximal portion of said antenna assembly; and

said manipulating includes manually gripping said flexible gripping member and said handle member to cooperatively and selectively bend said antenna assembly to selectively urge the window portion in abutting contact with the biological tissue surface to be ablated.

80. The method of claim 79, wherein

said handle member is a flexible elongated member.

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